



The Hybrid Electric Humvee — Providing Portable Power to the Force

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Sitting in the nucleus of the Brigade Combat Team's tactical operations center (TOC) synchronizing and coordinating the efforts of the staff during the operation at hand, the Soldier realizes that this isn't just a normal command center. For the first time, this operations center is powered by a Hybrid Humvee.

The Tank Automotive Research, Development and Engineering Center (TARDEC), working alongside DRS Technologies, has designed and developed a highly efficient mobile power source demonstrator — the XM1124 Hybrid Electric (HE) Humvee. The HE Humvee is an advanced series hybrid electric vehicle that houses an engine/generator as the prime power

source, a high-voltage battery pack for short-term load leveling and brake event energy storage, and has the ability to export power to other platforms or equipment. The vehicle demonstrator displays tactical mobility and, in some cases, surpasses the standard Humvee. With additional characteristics that reduce fuel consumption, provide for export power and meet some

standard Humvee requirements, the HE Humvee has payoffs that can be attained on current and future military vehicles.

Two HE Humvees have recently undergone the first vehicle Military Utility Assessment (MUA) phase, where Soldiers had the opportunity to perform field assessments on the vehicle's



Soldiers and Marines conduct Joint route reconnaissance along Alternate Service Road Boston between Camp AlTaqaddum and Camp Al Fallujah in Iraq. The troops were searching for improvised explosive devices along the heavily traveled convoy route. The HE Humvee will allow extended operations and provide auxiliary export power for external platforms and communications equipment. (DOD photo by LCPL Brian A. Jaques, U.S. Marine Corps.)



SPC Jeffrey Hamme (left) and SSG Michelangelo Merksamer, Headquarters Co., 1st Battalion, 506th Infantry, 4th Regimental Combat Team, explained several key HE Humvee features to visitors at the October 2005 Association of the United States Army Annual Meeting in Washington, DC. The two Soldiers participated in the MUA prototype vehicle test in September 2005 at Fort Campbell, KY. (U.S. Army photo by Gary Sheftick.)

capabilities. During the first assessment at Fort Campbell, KY, Soldiers drove the vehicle for six miles on battery power, convoyed in the HE diesel mode and used the vehicle's electrical system to power a battalion TOC.

The vehicle's Auxiliary Power Distribution System (APDS) provided auxiliary power to the 1st Battalion, 506th Infantry Regiment TOC for more than 100 hours, showing no signs of apparent power quality issues. The system powered Multi-Band Intra-Team radios, Blue Force Tracking, computer projector, laptop computers, map plotter and printer, coffee pot and the TOC lighting. For the assessment's duration, Soldiers had the opportunity to evaluate the HE Humvee in the key areas of:

- Mobility in hybrid mode
- Silent mobility in all-electric mode
- Portable battery recharging
- Silent watch

"Soldiers have liked the silent watch capability," said MAJ John Williamson from the Soldier Battle Lab, Fort Benning, GA. "It allows the Humvee to sit in a battle position at night and operate battery chargers and other

devices without the need to periodically run the engine to charge the battery."

Soldier Battle Lab is conducting the experimentation efforts for the MUA, and several additional capability experiments were performed by the lab during the Soldier Training Exercises. The Soldiers examined infrared camera images of the HE Humvee's heat signature in power-export mode and compared them to the heat signature of a 10-kilowatt (kW) Tactical Quiet Generator (TQG). Evaluations were also made of the vehicle's audible signature in power mode versus the 10-kW TQG audible signature. MUA results are pending the completion of the entire set of assessments and Soldier feedback.

SSG Michelangelo Merksamer, Headquarters Co., 1st Battalion, 506th Infantry, 4th Regimental Combat Team, explained, "It's a prototype and has faults. These assessments have been designed to

work out the vehicle's flaws. It has some application down the road once you work things out."

Further HE Humvee assessments began in late November 2005 at Fort Benning. Two vehicles will be included in an Air Assault Expeditionary Force MUA that will demonstrate powering another TOC command post (CP), which will be located inside a building. By tapping into the building power mains, the assessment will demonstrate a CP exportable power scenario, convoying in hybrid mode, silent watch and silent mobility, while also being able to recharge batteries for the warfighter.

During the assessments, one HE Humvee will be configured with a single APDS, capable of delivering 15 kW of alternating current (AC) power. A second HE Humvee will be configured with two APDSs capable of 15 kW each, for a total of 30 kW of non-synchronized AC power. The APDS-equipped vehicles will provide onboard mobile battery charging capabilities, while replacing portable generators and providing power to battalion TOCs.

The HE Humvee is configured as a highly efficient Series-Hybrid that combines a small, lightweight 2.2 liter diesel engine, an advanced lead acid



The HE Humvee demonstrator traverses a creek during the MUA at Fort Campbell. (Photo courtesy of the Soldier Battle Lab, Fort Benning, GA.)



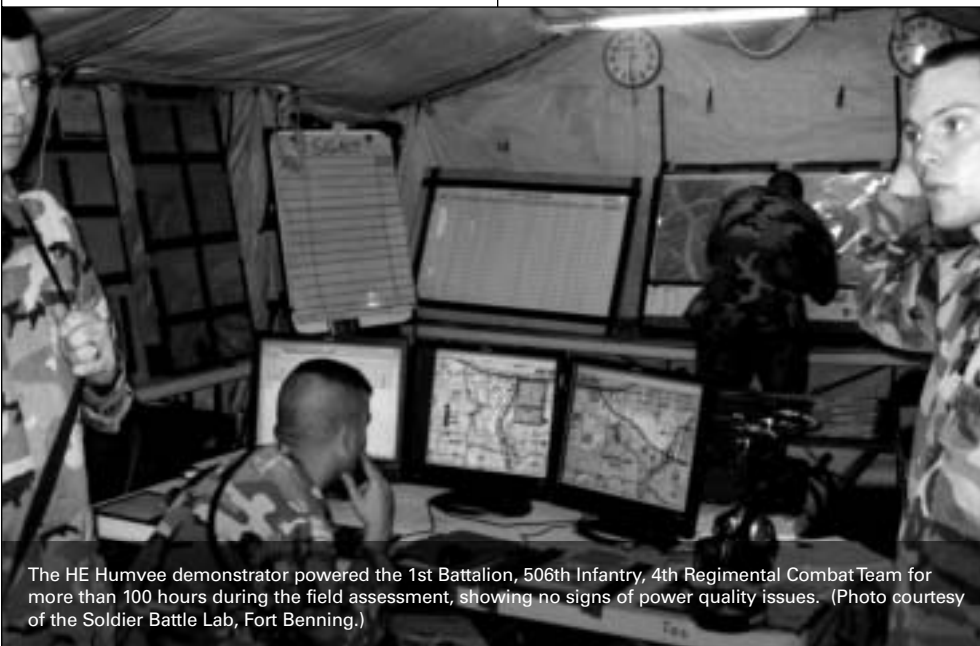
Configured with a single APDS, the HE Humvee is capable of delivering 15 kW of AC power. (Photo courtesy of the Soldier Battle Lab, Fort Benning.)

battery system and a brushless direct current (DC) generator, all of which provide sustaining electric power for the two-wheel drive motors. By using the vehicle's onboard 75-kW generator, storage batteries, energy management

system and the application of an APDS, the HE Humvee serves as an uninterrupted and efficient mobile power source. Additional DC power is available to the vehicle occupants while operating on terrain or while the

vehicle is stationary, giving the Soldier new options for mission planning and other planning-on-the-move operations.

Army benefits from HE power are endless. By applying this type of power source to military vehicles, the Army will have onboard power-generating capabilities and will highlight the capacities to recover braking energy, improve fuel economy, reduce emissions, provide silent mobility for increased survivability and improve Soldier mobility and performance.



The HE Humvee demonstrator powered the 1st Battalion, 506th Infantry, 4th Regimental Combat Team for more than 100 hours during the field assessment, showing no signs of power quality issues. (Photo courtesy of the Soldier Battle Lab, Fort Benning.)

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